

Coastal Flood Management

Global Innovations

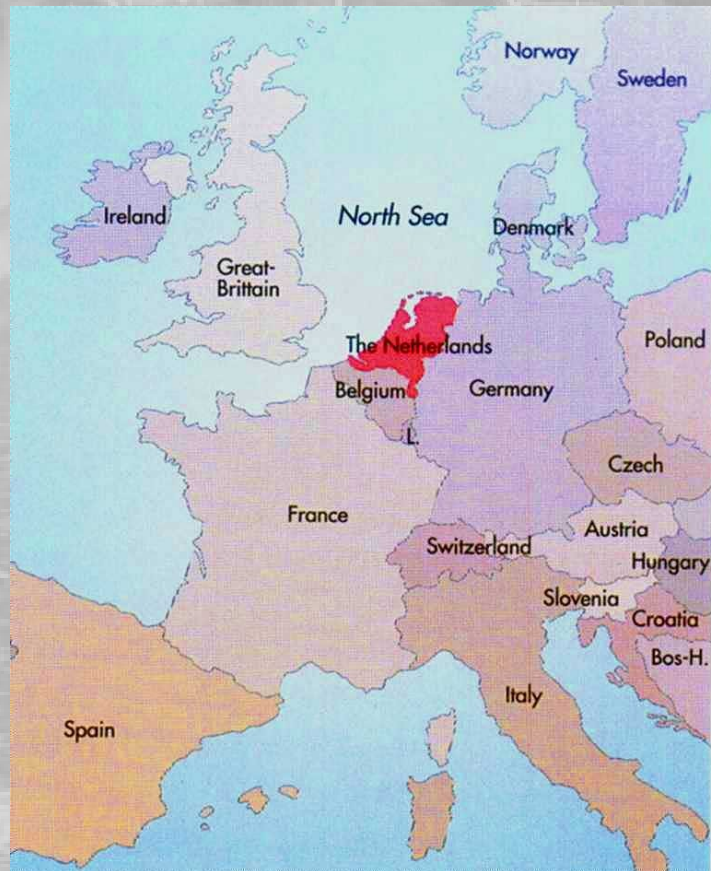
Tuesday, 13 December 2005



Today's program

- **Opening and welcome by Dennis Kamber**
- **Introduction by Piet Dircke**
- **09:45 - 11:30: Technical Sessions**
 - **Session 1: Building a Nation on Swaps**
 - **Session 2: Flood Protection in the Netherlands**
 - **Session 3: Innovative Global Flood Control Barriers**
- **11:30 - 13:00: Lunch**
- **13:00 - 15:00: Workshop**
- **15:00: Adjourn**

Situation of The Netherlands



The background of the slide is a grayscale photograph of a coastal defense structure, possibly a levee or a series of concrete pillars, with large, turbulent waves crashing against its base. The scene is dramatic, with white foam from the waves contrasting against the darker water and the structure.

Sessions 1 Establishing Flood Protection

“Founding a Nation on Swamps”

Looking into the past to learn about the future

Dr. David S. Gutzler

- 1: Overall history**
- 2: Southern Sea**
- 3: Delta Project**
- 4: River Projects**
- 5: Coastal Vision**
- 6: Safety levels**



Founding a Nation on Swamps

- From 12th century onwards: cultivation of fertile land
- Organized via “Water Boards”
- Many serious floodings changed the maps
- Standard responses:
 - Increase the heights of the dikes



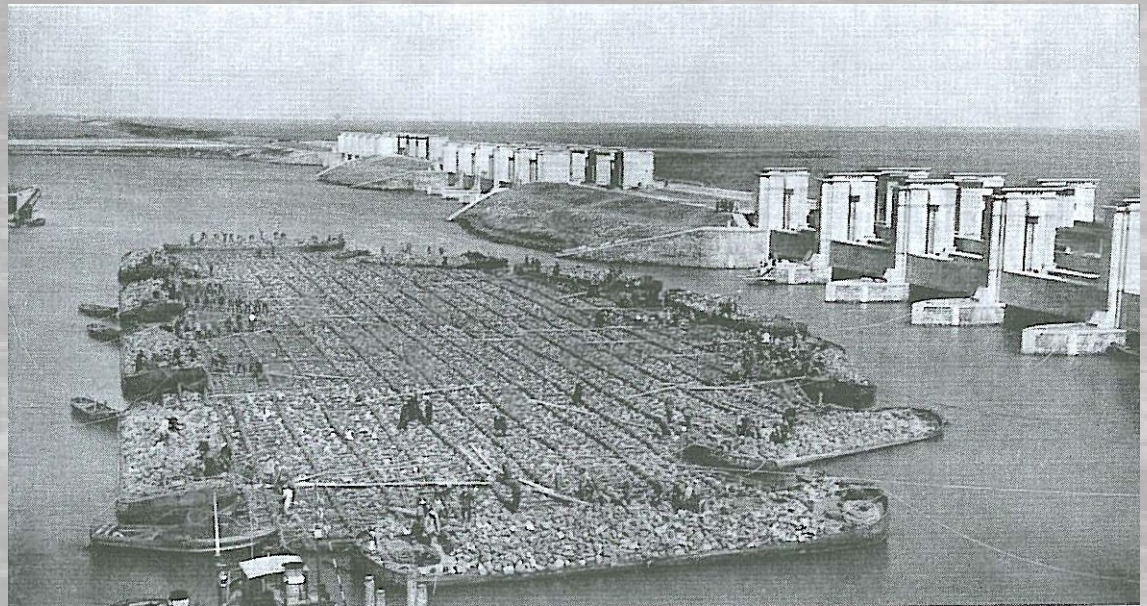
The Southern Sea Project

- Former lake, now tidal bay
- Surrounding areas vulnerable to flooding
- Weak dikes (poor foundation)
- Continuing need for agricultural land
- Most smaller lakes were already drained
- Various plans to close off the southern sea
- One final plan (private initiative)



The Closure dam

- **Important element: The Closure dam**
 - to ease the construction of the new polders
 - To shorten the line of defense (from 1900 to 1250 km)
- **The construction started only in 1920 (35 years later)**



The Southern Sea Project

- Southern Sea (salt) became IJssel Lake (fresh)
- Two huge sluice complexes for river run-off (8 billion m³/y)
- 1968: last polder (total 640 sq miles new agricultural land)
- Important role for science

The Delta Project

- Immediate cause : 1953 flooding
- The country was poorly protected
- Approach: closure of the estuaries by various types of structures



The Delta Project



Eastern Scheldt SSB



Maeslantkering

The various dams

■ (Additional) Advantages:

- Tools for national water management
- Improving agricultural conditions (fresh water)
- Better access to region (roads over the dams)
- Tide-free connection between ports
- Object of interests for visitors

■ Disadvantages

- Deposition of polluted sediments
- Deterioration of estuarine ecosys



Design Safety Levels

- What safety level was actually required?

- Risk-based approach (probabilistic)

$$\text{Risk} = \text{Probability} * \text{Potential Damage}$$

- Strategy: protect only what “deserves” to be protected

- No statistical data but flood marks

- Input for political arena where the choices were made

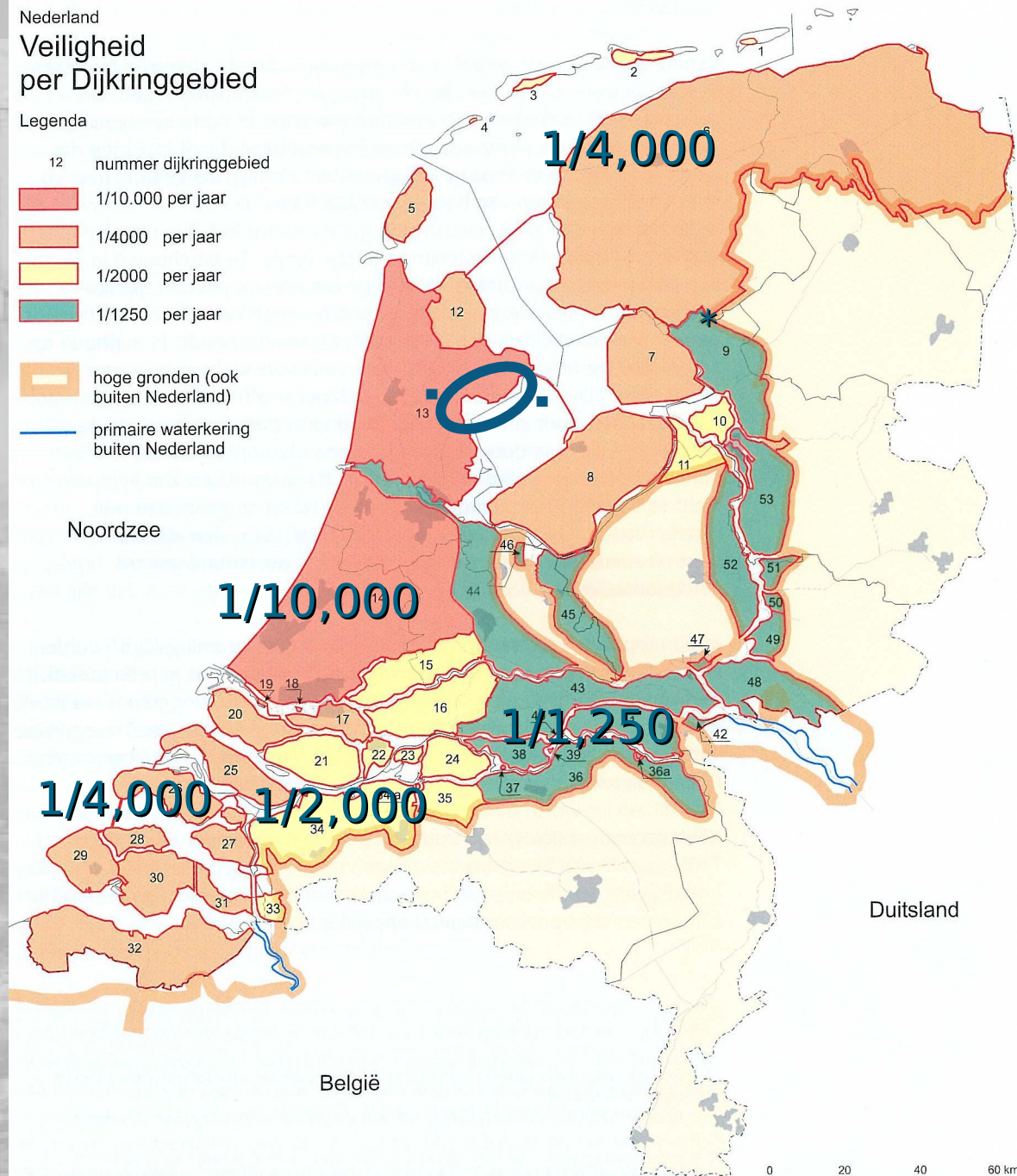
- Leading to “accepted flood probabilities” per specific area.

- Flooding probabilities were translated into water level exceedance frequencies

Nederland
Veiligheid
per Dijkkringgebied

Legenda

- 12 nummer dijkkringgebied
- 1/10.000 per jaar
 - 1/4000 per jaar
 - 1/2000 per jaar
 - 1/1250 per jaar
- hoge gronden (ook buiten Nederland)
- primaire waterkering buiten Nederland



Current Flood Protection Policy

- **Legal framework**
- **Regular maintenance**
- **Review all levees every five years**
- **Coastline maintenance based on sand nourishment**

River levee restoration

- Immediate cause: “almost-floods” of 1993/1995
- (evacuation of 250.000 people)
- Not so well protected against river floods
- Emergency levee reinforcement works



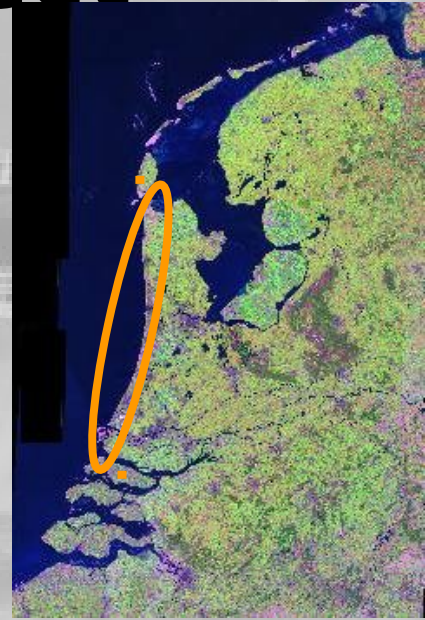
The “Space for the Rivers” - Project

- Immediate cause: acknowledgement of the effects of climate change (long term)
- Further raising the levees would not be sufficient
- Solution: lower the (design) water level!
- How: by giving more space to the river run-off
- Increase the width of the river bed
 - For safety,
 - For recreation, ecology, quality of life, ...
- Importance of Participative Government



The Coastal Vision 2050 Project

- Immediate cause: long-term developments in combination with increased human pressure
- Threats:
 - Accelerated sea level rise
 - Increased storm attacks
 - Much more at stake (compared to the Fifties)
- Challenges: Spatial development in the flood-prone areas
- Morphological studies and spatial planning combined

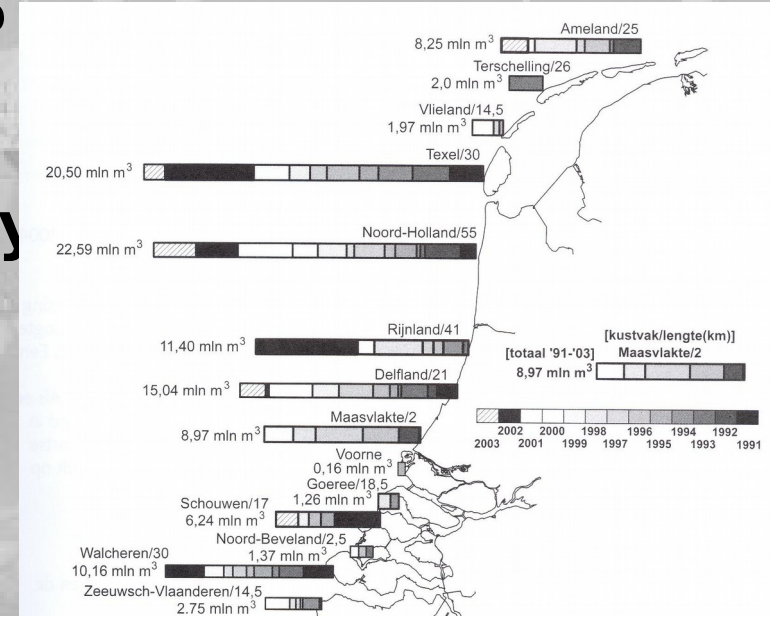


Four important issues

■ Shoreline management (policy



■ Maintaining safety for the hinterland (by L



Overview of cumulative nourishment volume



The Coastal Vision 2050 Project

- **Control the risks in the frontline (regulations, no criteria)**

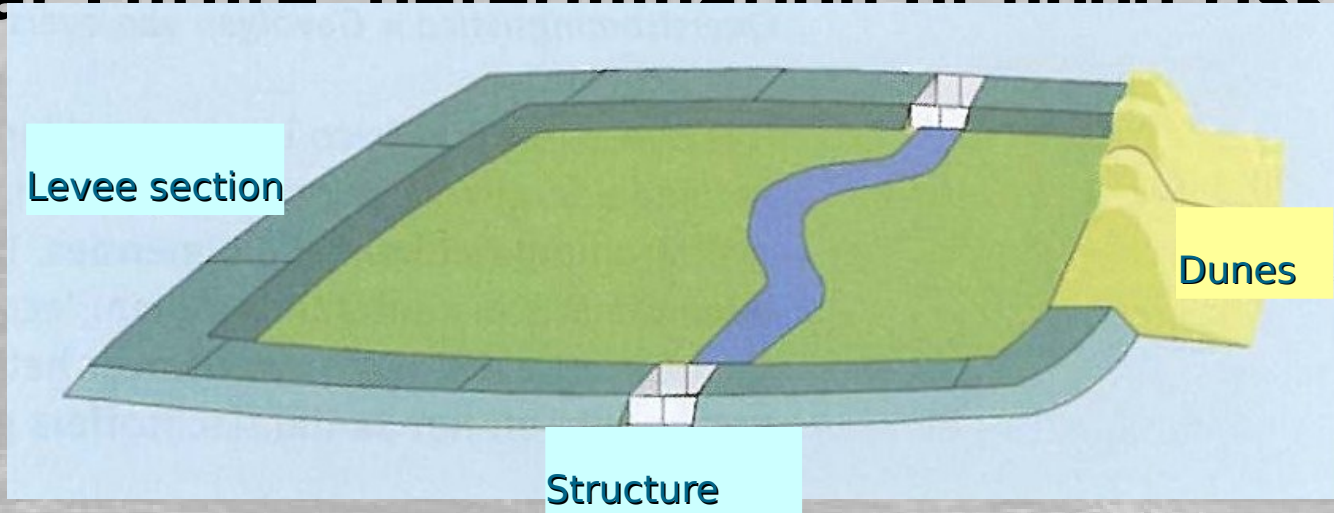


- **Control overtopping of the sea dikes (not one defense line, but a defense zone)**



Risk-Based Approach

- From: probability of exceedance of water levels
- To: probability of flooding of a dike ring area
- Near Future: determination of flood risks



- Example: further compartment of larger dike ring areas

Conclusions

- **Required to reach major achievements:**
 - **Vision, strategy, technical excellence,**
 - **Sense of urgency**
 - **Effective government**
- **Military analogy: reduce the length of the frontline**
- **Risk-based analysis: Defend what deserves to be protected**
- **Consider levee rings rather than levee sections (weak spots)**
- **The trigger today is climate change**
- **Importance of Science (beta, and alfa, gamma sciences)**

We prepare for them





Hereafter are some “spare images”

